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actually seen).* The darkest region appears to be contained within the red line, and in Mr. Dawes' drawing, No. 6, in the *Astronomical Register* for 1865 I can detect the same feature; but within this boundary some intense dark markings were observed, after long and severe scrutiny. These particularly dark marks seemed to have a branching character, and were observed on May 25th and 27th with a high power, and came out very much more distinctly through slight fog or haze, or a light passing cloud which intensified them and first revealed them to me. I look with much interest to the results obtained by other and better observers with more powerful optical means; but I must mention that, when the Kaiser Sea was visible in April, I did not notice anything of these peculiarly intense marks, though the dark region marked in red was very distinctly made out.

Burton-on-Trent, June 11, 1873.

Clock by Dr. Franklin. By R. J. Lecky, Esq.

The clock, which I have much pleasure in showing to the Society this evening, was made about the year 1819 for Roger Dartnell, Esq. M. D., Youghal, Co. Cork, and was used as his sidereal clock, in his Observatory on the town wall of that place, until his death, in 1832, when it came into my possession by bequest from him. The pendulum, with its mode of suspension, the friction crutch, and the weights, I have added to it myself.

It is, I believe, the simplest form of a really useful clock ever contrived, and is described in Rees' *Cyclopædia*, article "Clock," and figured in the plates of *Horology* as invented by Dr. Franklin; but Dr. Rees does not give his authority for this. He also gives another of somewhat similar construction by Ferguson, but not so simple as Franklin's. The train consists of only three wheels and two pinions. The great or centre wheel has 160 teeth, driving a pinion of 10 leaves on the arbor of the intermediate wheel; this has 120 teeth, driving 8 leaves on the 'scape wheel, which is of the ordinary kind, and has a simple "Graham" dead-beat 'scapement, not jewelled. This wheel, of course, carries the seconds-hand in the usual way; and the great wheel, which revolves in four hours, carries a hand which denotes both minutes and hours, the periphery of the dial being divided into 240 minutes, and each of the four quadrants consecutively numbered 0 to 60. Each quadrant, therefore, represents three hours, within which time it is requisite to know the hour; and herein consists the greatest drawback to the usefulness of this form of clock. This, however, might be easily remedied by a 12 or 24-pointed star and divided plate or hand set forward by four pins in the great wheel. The driving-weight simply acts on a grooved pulley fixed to the arbor of the great wheel, as in a common Dutch clock, and has a maintaining spring and ratchet to keep the clock going while being

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* This drawing was exhibited at the Meeting.

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wound. Mounted in this way it would require to be wound daily; I have, however, added a weight and counterpoise, fitted as double-sheaved blocks, the sheaves being contained in the body of the weights, which enable it to run for eight days; and by making the string endless, and passing it over a winding pulley, it acts as a "Huyghens pulley," thereby rendering the maintaining spring useless. The driving-weight is eight pounds, and the counterpoise four, the effective power, therefore, being 4 lbs.; and as this is divided on to four strings, the actual weight which propels the clock is only 1 lb. minus the friction of the pulleys. This gives the pendulum a swing of 3° 10′, the angle of escape being 1° 24′ (or 42′ at each side of zero); the excess being, therefore, 1° 46′ (or 53′ at each side). This excess is increased 14′ by using a single string with 1 lb. driving-weight, instead of the four sheaved blocks, owing to the decreased friction.

In a series of experiments on the swing, the clock being fresh cleaned and oiled, with weights increasing from $3\frac{1}{2}$ oz. up to 32 oz., I found that at this lower weight the clock would not go, but with $3\frac{3}{4}$ oz. it went, the swing being 1° 32′; with 4 oz. the swing was 1° 38′; 5 oz., 1° 56′; and the average increase of swing being from 5 to 8 oz., 12′; 8 to 12 oz., 9′; 12 to 16 oz., 6′; 16 to 24 oz., $4\frac{1}{2}$′, and 24 to 32 oz., 3′, the full swing being at this latter weight 4° 36′, or 2·18 at each side zero.

The pendulum is an ordinary Graham's quicksilver compensation. The rod is of the finest cast steel, and the bottle a piece of 2-inch cast-iron pipe, bored and turned, the top and bottom being wrought-iron. The rod passes through and is screwed into the latter, with a counter-nut and pointer below. The adjustments for both rate and beat are at the top, and can be used without stopping the clock. The screws for adjusting the beat move a slide which carries the pendulum; and one of them, that on the right-hand side, impinges on a loose brass piece which pinches the pendulum-spring against the edge of the slide, thereby always retaining it at the same point of suspension. The screw for adjusting the rate moves the pendulum-spring between this loose piece and the main slide, the right-hand beat-screw being first loosened; and the spring is suspended to its screw, as well as attached to the top of the pendulum-rod by pins passing through a centre line, thereby avoiding unequal tension to the edges of the spring, which is the constant cause of breakage. There is also a clamping screw to the spring at the top of the pendulum, but this is not tightened until the pendulum has found its true position.

The pendulum contains 11 lbs. 10 oz. mercury, 7·8 inches deep, the weight being altogether 17 lbs. 14 oz. I believe it to be slightly under-compensated.

I added an anti-friction crutch to the pallets, which I believe to be an essential benefit, although seldom adopted. It allows for the friction arising from the point of suspension of the pendulum and the centre of motion of the pallets not being in the same right line.

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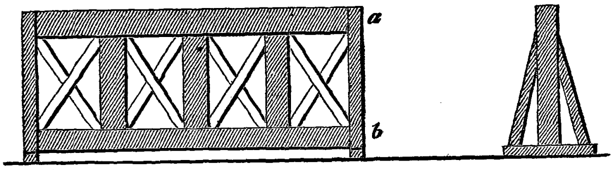
The case in which this clock is mounted is composed of slate slabs, the back being a single slab 1¼ inches thick, and to this the pendulum is suspended independent of the rest of the clock. The weight and rigidity of the slate give it great stability, and the clock goes with great steadiness, is very readily adjusted; and if a minimum of friction be a desideratum, I think this mode of construction possesses it more than any other.

On Sympathetic Influence between Clocks. By William Ellis, Esq. of the Royal Observatory, Greenwich.

It has been stated by clockmakers that clocks, if placed near together on the same wall or other support, will mutually influence each other, and in vol. xli. of the *Philosophical Transactions* there are two papers by Ellicott, giving an account of the "influence which two pendulum clocks were observed to have upon each other." Lately, however, having to test a number of clocks at the Royal Observatory, provided for use in the observations to be made of the Transit of *Venus* in the year 1874, some curious instances of sympathetic influence came accidentally under my own notice, concerning which the Astronomer Royal has requested me to draw up for presentation to the Royal Astronomical Society, a statement of the facts observed, since they appear to possess sufficient interest to make their publication desirable.

In order conveniently to rate at the Royal Observatory the clocks alluded to, a large and stout wooden stand was constructed, about eleven feet long and five feet high, along both sides of which the clocks could be ranged side by side. The stand is of the annexed form. The cross bracing (distinguished in the side view by not being shaded) was not at first supplied, and it was without these bracings that the stand was first used. Each clock-case was firmly screwed both to the upper and lower horizontal bars of the stand (*a* and *b* of the side-view sketch). When rating was commenced, two clocks only had been fixed, "Graham, No. 2," and "Arnold, No. 2," and it was soon remarked that there existed sympathetic influence, the difference between the times indicated by the two clocks remaining day after day constant. They were rated from 1872, May 2 to May 21, and an abstract of the rating is given in the following table:—



Side view. End view of one of the end standards.